

Air



Air ■ Cleaner

Introduction

Utah's mountain-and-valley topography, diverse economy, and a vastly growing population create some air quality challenges for the state. Despite these challenges, Utah's air is significantly cleaner than it was 25 years ago. Stricter regulations for motor vehicles and industry, as well as other emission reduction programs, have helped reduce smog and improved visibility. In the early 1980s, the health standards for four of the six criteria pollutants identified by the U.S. Environmental Protection Agency (EPA) were violated in one or more Utah counties. As of December 18, 2006, all Utah counties attained current federal air quality standards. Remarkably, the improvement comes after significant population growth, an achievement equaled by only a few other states.

Scientific evidence about the health effects of air pollutants have led to tighter standards for ozone and very fine particles known as PM_{2.5}. Cache Valley in northern Utah is on the verge of violating the current standard and new EPA rules will make it even tougher for all counties to meet standards. In September 2006, EPA lowered the allowable daily average of fine particles from 65 micrograms per cubic meter (ug/m³) to 35 ug/m³, and EPA's Science Advisory Committee is recommending that the health standard for ozone be tightened next year making it even more challenging for the Wasatch Front to meet the tougher new health standards in years ahead. For more information on the new standards visit: <http://epa.gov/pm/naaqsrev2006.html>

This chapter focuses on the quality of Utah's air and partnership efforts by DEQ to reduce regional haze. The data used in compiling this chapter can be found at: http://www.airquality.utah.gov/Public-Interest/annual-report/Index_2005.htm.

The **Utah Air Conservation Act** **Utah Code 19-2-104** empowers the **Utah Air Quality Board** to enact rules pertaining to air quality issues and develop **State Implementation Plans** to attain and maintain **National Ambient Air Quality Standards**. The Division of Air Quality staff supports the Board in its policy-making role. The 11-member board is made up of diverse interests knowledgeable in air pollution matters and appointed by the governor with consent of the Senate. For more information about the Board and its members, visit www.airquality.utah.gov/Air-Quality-Board/index.htm

Choose Clean Air Success Story

DEQ has made strides to keep air pollution levels down through its **“Choose Clean Air”** campaign that encourages Utahns to voluntarily reduce vehicle use during winter inversions and summer smog that can make breathing difficult for the young and old and those suffering from asthma. For more information on the Choose Clean Air program, visit www.cleanaire.utah.gov.

Air Quality Pollutants

In the 1970s, EPA identified six criteria air pollutants for which it established **National Ambient Air Quality Standards** (NAAQS) under the **Clean Air Act**: carbon monoxide (CO), lead, nitrogen dioxide (NO₂), ground-level ozone, particulate matter, and sulfur dioxide (SO₂). (See chart below). For more information, visit: www.epa.gov/air/criteria.html.

Two of the pollutants that were at issue 25 years ago are no longer a concern to Utah and most other states. Carbon monoxide comes almost entirely from vehicles, and the federally-required controls installed by manufacturers have eliminated the problem in newer vehicles. Almost all of the lead in the atmosphere in the 1970s was from leaded gasoline. When federal rules required lead to be eliminated, the lead emissions dropped to nearly zero.

Carbon Monoxide (CO); A clear, colorless, odorless gas.	Lead	Nitrogen Dioxide (one component of NO _x); A smog-forming chemical.	Ozone (ground-level ozone is the principal component of smog).	Particulate Matter (PM ₁₀ , PM _{2.5}); dust, smoke, soot.	Sulfur Dioxide	VOCs (volatile organic compounds); smog-formers
<p><u>Sources</u> Burning of gasoline, wood, natural gas, coal, oil, etc.</p> <p><u>Health Effects</u> Reduces the ability of blood to transport oxygen to body cells and tissues; cells and tissues need oxygen to work. Carbon monoxide may be particularly hazardous to people who have heart or circulatory (blood vessel) problems and people who have damaged lungs or breathing passages.</p> <p><u>Environmental Effects</u> Global climate change.</p>	<p><u>Sources</u> Lead paint (houses, cars), smelters (metal refineries); manufacture of lead storage batteries; note: burning leaded gasoline was the primary source of lead pollution in the US until unleaded gasoline was mandated by the federal government.</p> <p><u>Health Effects</u> Lead damages nervous systems, including brains, and causes digestive system damage. Children are at special risk. Some lead-containing chemicals cause cancer in animals.</p> <p><u>Environmental Effects</u> Lead can harm wildlife.</p>	<p><u>Sources</u> Burning of gasoline, natural gas, coal, oil, etc. Cars are an important source of NO_x.</p> <p><u>Health Effects</u> Nitrogen dioxide can cause lung damage, illnesses of breathing passages and lungs (respiratory system).</p> <p><u>Environmental Effects</u> Nitrogen dioxide is an ingredient of acid rain (acid aerosols), which can damage trees, lakes, flora and fauna. Acid aerosols can also reduce visibility.</p>	<p><u>Sources</u> Chemical reaction of pollutants; VOCs and NO_x.</p> <p><u>Health Effects</u> Ozone can cause breathing problems, reduced lung function, asthma, irritated eyes, stuffy noses, and reduced resistance to colds and other infections. It may also speed up aging of lung tissue.</p> <p><u>Environmental Effects</u> Ozone can damage plants and trees; smog can cause reduced visibility.</p>	<p><u>Sources</u> Burning of wood, coal, diesel and other fuels; industrial plants; agriculture (plowing, burning fields); unpaved roads, mining, construction activities. Particles are formed from the reaction of VOCs, NO_x, SO_x and other pollutants in the air.</p> <p><u>Health Effects</u> Particulate matter can cause nose and throat irritation, lung damage, bronchitis, and early death.</p> <p><u>Environmental Effects</u> Particulates are the main source of haze that reduces visibility.</p>	<p><u>Sources</u> Burning of coal and oil (including diesel and gasoline); industrial processes.</p> <p><u>Health Effects</u> Sulfur dioxide can cause breathing problems and may cause permanent damage to lungs.</p> <p><u>Environmental Effects</u> SO₂ is an ingredient in acid rain (acid aerosols), which can damage trees, lakes, flora and fauna. Acid aerosols can also reduce visibility.</p>	<p><u>Sources</u> The principle source of VOCs is nature (such as pine forests), since VOCs are released from most living organisms. VOCs are also released from burning fuel (gasoline, oil, wood, coal, natural gas, etc.), solvents, paints glues and other products used at work or at home. Cars are an important source of VOCs. VOCs include chemicals such as benzene, toluene, methylene chloride and methyl chloroform.</p> <p><u>Health Effects</u> In addition to ozone (smog) effects, many VOCs can cause serious health problems such as cancer.</p> <p><u>Environmental Effects</u> In addition to ozone (smog) effects, some VOCs such as formaldehyde and ethylene may harm plants.</p>

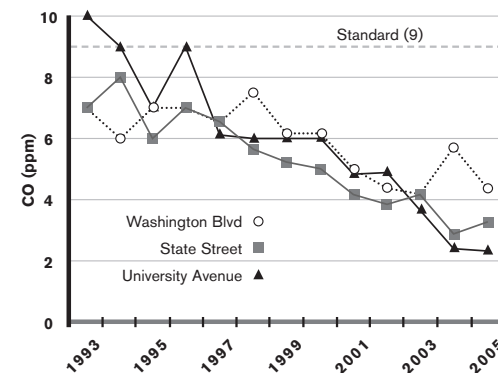
Carbon Monoxide CO

CO is produced primarily by motor vehicles, wood burning stoves and fireplaces. In the 1980s and 90s, the Division of Air Quality monitoring of Ogden, Provo and Salt Lake City revealed many violations of the federal standard. Improvements in automobile technology have helped all three cities attain the standard.

But more significantly, there has not been any recorded violation of the CO standard at any of the air monitoring stations in Utah since 1993. This is significant given that Utah's population is among the fastest growing in the United States. Utah is the fourth fastest-growing state in the nation, with a population of 2.5 million, increasing 3.2 percent from the previous year. For more information on Utah's demographics: www.governor.utah.gov/dea/EconomicSummary.pdf.

The figure to the right shows a 13-year trend in CO emissions. The steady decline is primarily due to improvements in vehicle emissions technology.

CO Second Highest 8-hr Concentration



Lead Pb

In the past, leaded gasoline was a source of lead pollution, which when inhaled can cause damage to the nervous system. However, the leaded fuels were phased out under a federal ban, by the end of 1995, and gasoline is no longer a significant source of air-borne lead pollution. Unleaded gasoline was introduced in the 1970s. For more information visit: www.epa.gov/air/urbanair/lead/effrt.html.

The major remaining sources of lead pollution in Utah are the extraction and processing of metallic ores, particles from deteriorating lead-based paint, and improper removal of lead-based paint. The current three-month standard for lead is an average concentration not to exceed 1.5 micrograms per cubic meter of air. Utah has not exceeded that health standard since the late 1970s.

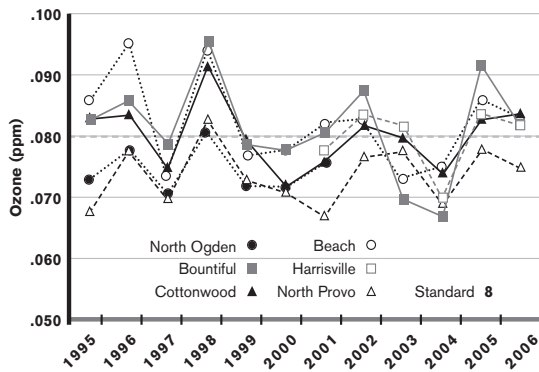
Nitrogen Dioxide NO₂

During high temperature combustion, the nitrogen in the air reacts with oxygen to produce various nitrogen oxides (NO_x), a reddish-brown gas. One type, nitrogen dioxide (NO₂), is considered a criteria pollutant under EPA standards.

The DAQ monitors the concentrations of NO₂ at various locations, but has never found a circumstance where the state violated EPA's annual standard of 0.053 parts per million (ppm). However, these oxides of nitrogen tend to react with other air contaminants to form other criteria pollutants. In the summer, photochemical reactions with volatile organic compounds (VOCs) lead to ground-level ozone. In both winter and summer, NO_x reacts with ammonia to form fine particulate matter (PM_{2.5}).



Ozone Fourth Highest 8-hr Concentration



Ozone O₃

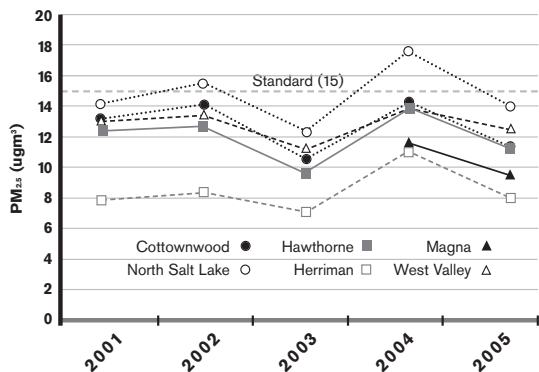
Ozone is formed when volatile organic compounds (VOCs) and nitrogen oxides (NO_x) mix with sunlight and heat. Ozone is principally a summer time problem when temperatures are high and daylight hours are long, but it may have implications to wintertime particulate problems as well.

The Clean Air Act defines a non-attainment area as an area that is violating the national ambient air quality standard or contributing to a violation of the standard in a nearby area. The 8-hour ozone standard is based on averaging air quality measurements over eight hour blocks of time. EPA uses the average of the annual fourth highest 8-hour daily maximum concentrations from each of the last three years of air quality monitoring data to determine a violation of the ozone standard. To comply with the ozone standard, the average must be below 0.08 parts per million.

In the early 1980s, Salt Lake and Davis counties were in violation of the old one-hour ozone standard. By the early 1990s, Utah was in compliance with the one-hour EPA standards. But in 1997, a new 8-hour standard was promulgated and the one-hour standard revoked. Salt Lake and Davis counties are able to meet those standards, although they do so only by the slimmest of margins. EPA is under a court order to finalize the standard by March 2007. If the standards are tightened, many areas of Utah will have a difficult time meeting the new rules.

The figure at top left shows the recent trend in Ozone.

PM_{2.5} Annual Mean Concentrations (ugm³)



Particulate Matter PM

Particulate matter refers to the tiny particles found in the atmosphere that range in size from less than one tenth of a micron (about one-tenth the size of a human hair) up to 50 microns. Particles 10 microns in size and smaller – otherwise known as PM₁₀ – can lodge deep in the lungs and are not expelled which can cause respiratory problems. Fine particulate matter known as PM_{2.5} – those particles less than or equal to 2.5 micrometers – is a more serious health problem. In 1997, EPA adopted new standards for PM_{2.5}, setting the standard at 15 g/m³ (micrograms per cubic meter) on an annual basis and 65 g/m³ for a 24 hour average. EPA has lowered the limit on the 24-hour average to 35 g/m³.

Several areas along the Wasatch Front did not meet the PM₁₀ standard when it was first promulgated, but all of Utah has met the standard since 1994. The new standards will prove to be much more difficult to meet. DEQ monitors the air for the criteria pollutants hourly at air monitoring stations around the state. More information on the air monitoring station locations can be found at www.airmonitoring.utah.gov/utahmap.htm.

The figure at bottom left shows the recent trend in PM_{2.5}.

Sulfur Dioxide SO₂

SO₂ is emitted primarily from burning fossil fuels, mainly coal and oil from power plants and refineries. In the 1970s, the Magna air quality monitor routinely measured violations of the 24-hour standard due to emissions from Kennecott Utah Copper. In the mid-1990s, Kennecott Utah Copper, Geneva Steel and other industries in the state made dramatic reductions in SO₂ emissions. Since 1994, the state has been meeting the federal health standard.

The figure to the right shows a 30-year trend of the monitored concentrations of SO₂.

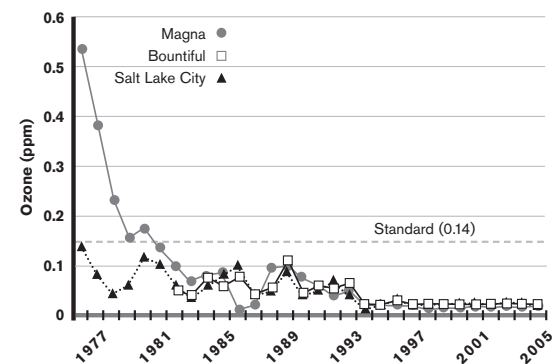
Indoor Air

Radon Gas

Radon is an odorless gas and the second leading cause of lung cancer behind smoking. The Utah Division of Radiation Control (DRC) Indoor Radon Program, funded by the State Indoor Radon Grant from the EPA, attempts to reduce the indoor radon concentrations in homes throughout the state to concentrations less than EPA's 4.0 picocuries per liter. DRC does this through public outreach, conducting surveys and providing individualized assistance to homeowners and public agencies on all aspects of the indoor radon hazard problem.

About 900 radon tests are conducted each year in Utah, resulting in about 150 mitigation systems installed in households in 2005. For more information, visit: www.epa.gov/iaq/radon/index.html and www.radon.utah.gov.

Sulfur Dioxide Second Highest 24-hr Values



Hawthorne Success Story

In 2004, **DEQ** teamed up with the **Utah Department of Health** and the **University of Utah** to study the air quality and its effects on children's respiratory health. Data collected during the winter of a two-year study showed children were breathing air of three times better quality inside the school than outdoors during winter inversion days. The "**Hawthorne Health Project**" evaluated air quality data of the 60 students who participated in pulmonary tests to show how air quality affects respiratory health.



Regional Haze

Utah is home to numerous national parks visited by millions of people. Haze can obscure the ability to see clearly over long distances (visibility) and is recognized as a serious problem throughout the nation, and more commonly in the Eastern United States. Haze is caused when light encounters tiny pollution particles and gases in the air. Forest fires and windblown dust as well as some industrial sources and vehicle emissions contribute to haze.

When the Clean Air Act was reauthorized by Congress in 1990, it included provisions to improve visibility in national parks and wilderness areas, and to establish a commission to determine the causes of poor visibility at the Grand Canyon. The Commission determined that many kinds of sources contributed to the poor visibility and it recommended strategies for improvement. For more information, visit www.wrapair.org/309/index.html. Those strategies were included in EPA's 1999 regulations as an option that Western states could use in developing visibility plans required of all states.

Utah is one of five states that submitted plans in 2003 under this option. Key elements of the plan include using a regional cap on SO₂ emissions and a backstop market trading program to be triggered if emissions exceed the emissions cap. Other components identify reduced emissions from prescribed fires and a requirement to track emissions and visibility conditions every five years through 2018. For more information: www.wrapair.org.

The Milestone Reports for 2003 and 2004 that were prepared by the five states show that actual SO₂ emissions are approximately 25 percent below the emission cap for each year. Western states and Indian tribes that make up the Western Regional Air Partnership continue to work together to make added improvements. A plan update is due in 2007.

Energy Policy

When Gov. Jon Huntsman, Jr. took office in 2005, the state's energy office was reorganized. He appointed Dr. Laura Nelson as the state's energy advisor. DEQ works in partnership with Dr. Nelson to implement energy programs, including alternative energy, conservation and efficiency. For instance, the task of administering the Clean Fuels Fund – established in the early 1990s to offer loans and grants to corporations and government entities making the switch to cleaner fuels and technologies – was moved to DEQ. Prior to reorganization under DEQ, \$925,000 in loans have helped pay for about 81 clean fuel vehicles and two clean fuel refueling stations. Another \$180,000 has been awarded in grants to 40 different entities to purchase 69 clean vehicles.

PowerForward Success Story

On May 30, 2006, **Gov. Jon Huntsman, Jr.** signed an executive order directing state employees to heed **PowerForward** email alerts to conserve electricity during the summer. The PowerForward campaign, managed by **DEQ's Air Quality Division**, is an important part of the governor's statewide goal of a 20 percent increase in energy efficiency by 2015. PowerForward asks consumers to voluntarily reduce electric use between the peak times between noon and 8 p.m. when Utahns should put the brakes on turning up their air conditioners. This program started in 2001 as a simple alert system and has progressed significantly to a broader program aimed at promoting an ethic of electricity conservation in Utah. In a given year there has been a savings of up to 100 megawatts of power, which equates to enough power for 70,000 homes in 2005. For more information, visit: www.powerforward.utah.gov.



Photo: Brandon Smart, DEQ

Utah Gov. Huntsman signs PowerForward executive order with Dianne Nielson and Rich Walje, President of Rocky Mountain Power, by his side.